

Lamination Techniques for Convertors of Laminating Adhesives

Lamination Process

Basic Requirements for Good Results

1. Clean Substrates.
2. Selection of correct adhesive for the job.
3. Proper equipment and lamination conditions.

Lamination Process Conditions

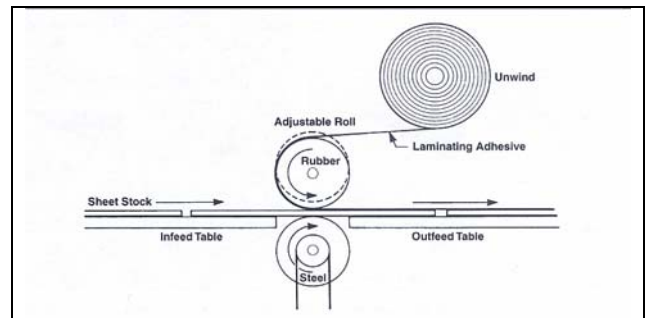
Problems

Problems	These problems can be solved by adjusting the following
Wrinkles, misalignment, poor bond, cross web curl	Roll condition, tension control
Internal laminate stresses, down web curl, edge lifting	In and Out Feed, tension control
Wrinkles, bubbles, alignment	Thread Up
Weak bond, adhesive ooze, steering trouble, wrinkles	Nip adjustment, tension control
Trapped air bubbles, wrinkles, adhesive picking	Contact Point

A few basic requirements must be followed

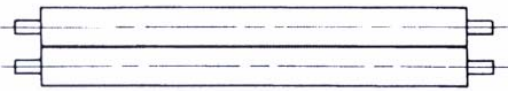
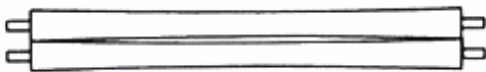
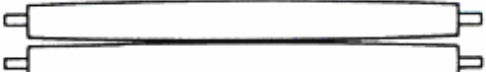

There are several variables that can affect proper lamination conditions. Most of these variables are a result of laminator condition and adjustments. These problems can cause completely unsatisfactory laminations.

Typical Lamination Machine

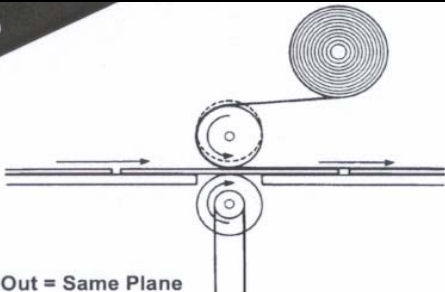
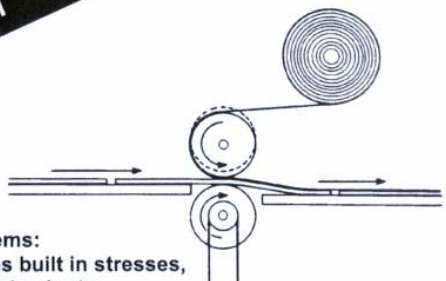


With a typical laminator, there can be many variations, but all should use this basic thread up.

Roll Condition

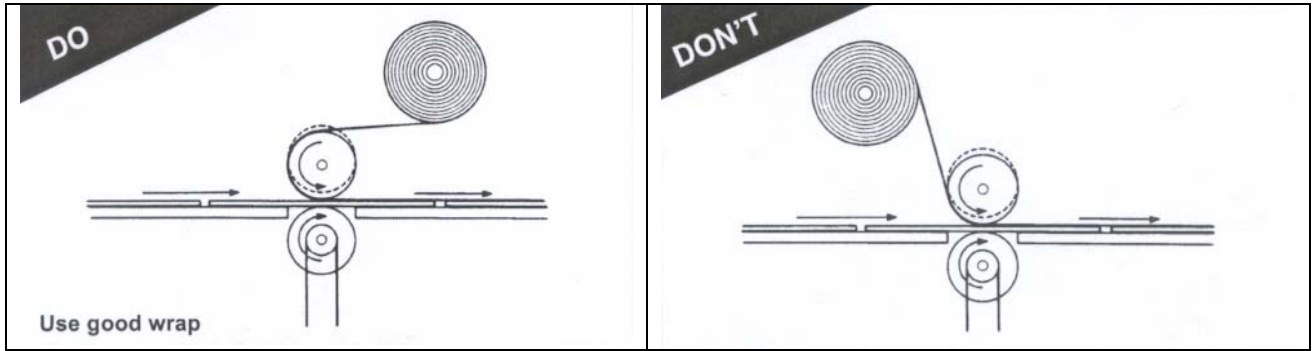
<p>DO</p>  <p>Smooth Clean, Parallel, Properly adjusted pressure</p>	<p>DON'T Concave</p>  <p>Problems: Poor Bond, Adhesive Picking, Trapped Air Bubbles</p>
<p>Good lamination must start with nip rolls in excellent condition and adjustment. The upper and lower rolls should be smooth, clean, parallel, and have left and right side pressure adjustability.</p> <p>Concave, convex or canted rolls will cause problems such as poor adhesion, adhesive picking, lifting, wrinkling trapped air bubbles and web steering difficulty.</p>	<p>DON'T Convex</p>  <p>Problems: Poor Bond, Edge Life, Bubbles</p> <hr/> <p>DON'T Canted</p>  <p>Problems: Steering, Wrinkles, Bubbles</p>

Feed – In and Out

<p>DO</p>  <p>In & Out = Same Plane</p>	<p>DON'T</p>  <p>Problems: Causes built in stresses, curl or laminate.</p>
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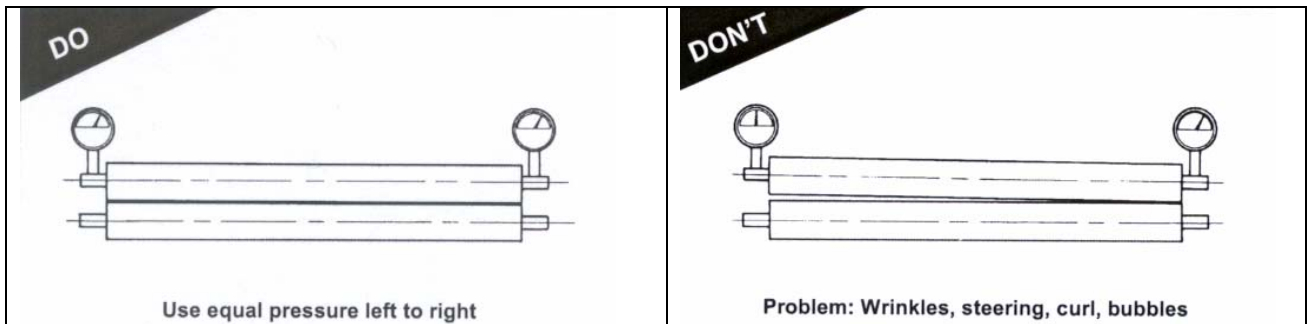
The in and out feed tables must be at the same level or plane and should be of adequate length to hold at least one sheet of substrate. There will normally be curl stresses if the out feed table is positioned as shown above.

Thread Up – Roll Wrap



It is also very important that the roll of laminating adhesive be threaded into the machine so that there is a good smooth wrap around the rubber roll. This will smooth the adhesive and liner and prepare it to be laid down on to the substrate. A lesser degree of roll wrap will not accomplish this and wrinkling and bubbling may result.

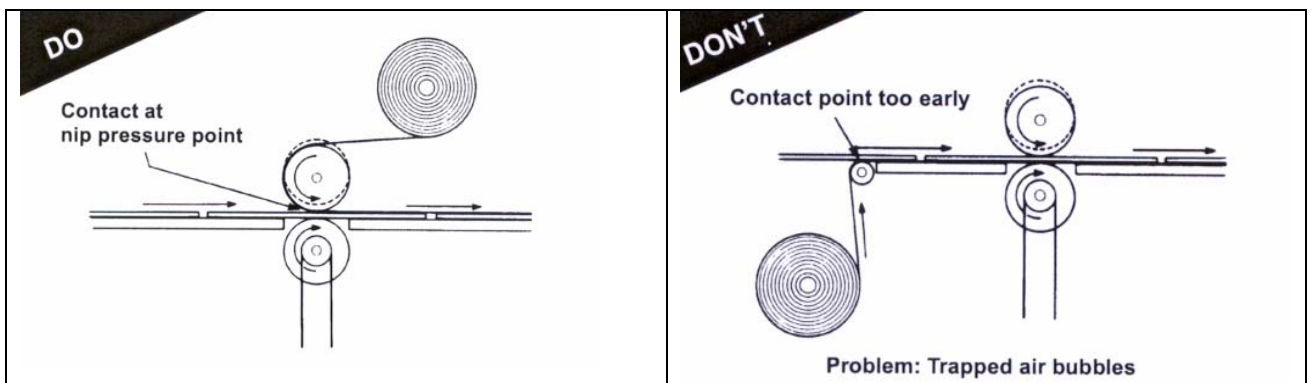
Nip Pressure



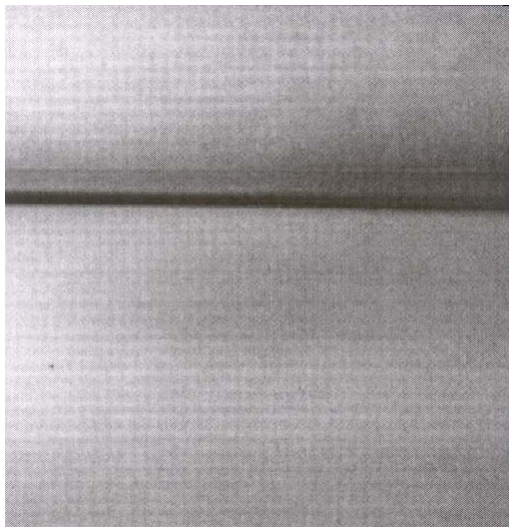
Nip roll pressures can be controlled either manually by screw downs or air cylinders. The best design would be single control for simultaneous and uniform adjustment of both actuators.

The major problems of non-uniform pressure as shown (exaggerated) here, are wrinkling and steering of the web

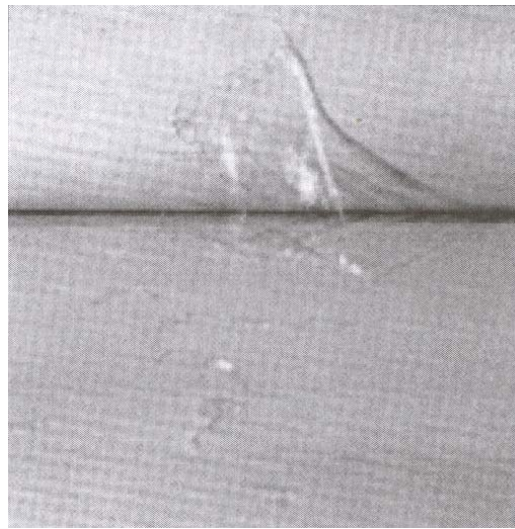
L/A – Substrate Contact Point



A common application problem is caused if the technique allows the laminating adhesive to contact the substrate prior to the nip pressure point. Air entrapment can only be minimised or eliminated by keeping the adhesive off the substrate until it enters the nip contact point. The diagram on the right shows how air can be trapped by premature non-pressure contact of the laminate materials. The air will then remain trapped in the laminate as it passes through the nip and trapped air results in adhesive picking during liner removal.



This photograph shows the liner being removed smoothly from a good lamination



This photograph shows the adhesive picking or lifting problems due to an entrapped air bubble. This is a common cause for reject parts.

General Nip Roll Characteristics for PSA Laminating

- A) Top Roll – Rubber or elastomer
 Urethane
 Neoprene
 Silicone
 35-40 Shore A durometer hardness for urethane or neoprene
 60-80 Shore A for silicon
 Top roll applies pressure to laminating adhesive and rubber allows deflection to compensate for calliper variations.
- B) Bottom (back-up) Roll = Steel or hard rubber
 Nickel or chromium plated to resist corrosion and nicks, and easy to clean.
- C) Correct roll diameter to roll width ratio is required to prevent roll deflection. Generally 15.2cm – 20.3cm (6-8”) roll diameter is required for 76.2cm (30”) wide laminator.

Nip Roll Pressure

- Depends on adhesive and substrate
- General = 1 ¾ to 20 pounds per lineal inch (PLI)
- Screw adjusters
- Air cylinder adjusters (preferable)
- Lower pressure for softer adhesives and fragile substrates
- Higher Pressure for firm adhesives and substrates
- Must be uniform across web

Roll pressure is best determined by trial, and depends on the firmness of the adhesive, type of substrate and rolls. Roll pressure must be uniform across the web to prevent wrinkles and to give proper adhesive contact and bond strength.

Summary

To Laminate

- 1) Clean substrate surface.
- 2) Always laminate to exclude air entrapment.
- 3) Provide adequate uniform nip roll pressure.
- 4) Provide good roll wrap (i.e. 180°), web tension, and steering for a wrinkle-free laminate.
- 5) Allow minimum adhesive dwell time of 15-30 minutes before liner removal, 24 hours is preferable.

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Related 3M Literature

Listed below is related 3M Technical Literature which may be of interest:

Subject	Product Bulletin	Instruction Bulletin
Printing, Lamination And Application Of Scotchgard™ Protector Graphic Film 8050	8050	4.99.1

Sales Assistance

Commercial Graphics Group
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